

**MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
AIR QUALITY DIVISION**

OPERATIONAL MEMORANDUM  
NO. 5

SUBJECT: PROCEDURES FOR CORRELATING MICHIGAN'S AND U. S. ENVIRONMENTAL PROTECTION AGENCY'S (USEPA) DEFINITION OF VOLATILE ORGANIC COMPOUND (VOC).

(Incorporation of USEPA criteria for determining potential VOC emissions from non-surface coating processes to determine; 1) renewable operating permit applicability, and 2) compliance with VOC emission limits and standards)

EFFECTIVE DATE: October 13, 1995

**PREAMBLE**

A. EXPANDED COMPOUND EXEMPTION LIST

For years USEPA has defined the term VOC as organic compounds which participate in photochemical reactions which form ozone. The USEPA definition contains a list of compounds that are specifically exempted based on low reactivity (e.g. methylene chloride, Freon compounds). Likewise, the Michigan Department of Environmental Quality (MDEQ) has excluded a number of compounds from its VOC definition, although the list of exempted compounds is smaller than USEPA's.

In the past year, USEPA has revised the federal definition of VOC by adding several organic compounds to the exclusion list in the definition, namely, acetone, volatile methyl siloxanes and parachlorobenzotrifluoride. These compounds are generally used as follows: acetone is a chemical feedstock, a solvent cleaner, and a solvent component in coatings; volatile methyl siloxanes are used in personal care products, other consumer products, and potentially as a substitute for some chlorofluorocarbons(CFCs); parachlorobenzotrifluoride is a solvent cleaner and a substitute for some CFCs. The exclusions are based on these compounds having negligible photochemical reactivity. USEPA's action of exempting these compounds from its VOC definition has prompted the MDEQ to re-evaluate its VOC definition. As a result of this re-evaluation, acetone and volatile methyl siloxanes will be proposed for exemption from the Michigan VOC definition through rulemaking. Parachlorobenzotrifluoride is still being evaluated by MDEQ staff for possible toxic impacts, and will also be proposed for exemption if the evaluation ends satisfactorily.

To address concerns that the process of exempting additional compounds from the VOC definition can result in additional permit applicability for a source, Part C has been included in the policy statement of this memorandum. The intent of Part C is to allow sources that have been exempt from permit requirement by small VOC source provisions in Part 2 of Michigan's air rules to remain exempt, in spite of the fact that the emissions are no longer treated as VOC by action of this memorandum.

## B. NON-SURFACE COATING MATERIALS CONTAINING VOCs

In the past, Michigan's air regulations defined a VOC as being "any compound of carbon or mixture of compounds of carbon..." having a vapor pressure greater than 0.1 millimeters of mercury (mmHg) at standard conditions. A number of carbon compounds, such as methane and ethane were listed as exempt because of negligible reactivity.

In the late 1980's, USEPA cited Michigan's State Implementation Plan (SIP) as deficient because Michigan's definition of VOC did not mirror the new USEPA definition. Although Air Quality Division (AQD) staff opposed changing the definition of VOC, the state was ultimately required to adopt the new definition in order to obtain approval of the SIP. This rule change took effect in April 1993.

Michigan's definition of a VOC continues to include any compound of carbon or mixture of compounds of carbon that has a vapor pressure of more than 0.1 mmHg at standard conditions, excluding a list of specified compounds. Added to this definition, in order to satisfy USEPA, is any compound of carbon or mixture of compounds of carbon that has a vapor pressure of less than or equal to 0.1 mmHg at standard conditions unless the compound is determined by the MDEQ to have negligible photochemical reactivity. The definition continues on to read "The methods described in R336.2004 and R336.2040 shall be used for measuring VOCs for purposes of determining compliance with emission limits."

This definition change results in many non-surface coating production materials that were never considered to be VOCs, or to emit VOCs, to now be defined as VOCs. For example: lubricating oils, crude oil, coal and wood may be considered VOCs under the existing VOC definition. As a consequence, facilities subject to VOC emission limits specified in rules or in permits may now determine that their potential VOC emissions are greater than calculated according to the previous definition. Further, the possibility exists that these facilities could now be determined as not meeting those specified emissions limits. Additional implications under Michigan's renewable operating permit program (Title V) arise due to the duty of the owner/operator of a facility to certify as to the accuracy of the facility's emissions estimates.

In a study conducted by USEPA entitled "Study of Volatile Organic Compound Emissions from Consumer and Commercial Products," dated March 1995, USEPA encountered these very problems with their expanded VOC definition. This study was mandated by Section 183(e) of the 1990 Clean Air Act Amendments (CAAA) and was sent as a report to Congress. The objectives of the study were: 1) to determine the potential of consumer and commercial product VOC emissions to contribute to ozone levels which violate the National Ambient Air Quality Standard for ozone; and 2) to establish criteria for regulating consumer and commercial products or classes or categories of products under the authority of Section 183(e) of the CAAA.

USEPA recognized during the course of this study that many consumer products contained ingredients which are of extremely low volatility (i.e., some ingredients evaporate at such a low rate that they do not enter into the air to any appreciable degree). Reference was made to some of the types of materials used in many facilities throughout the State of Michigan (and facilities in other states). USEPA recognized that if volatility is not considered, many consumer products

(materials used in various processes) contain 100 percent VOC by definition even though portions of their contents do not become available to react with oxides of nitrogen in the atmosphere to form ozone. In essence, USEPA confronted the problem of how to evaluate these products by taking into consideration the volatility of the VOC contained in the products of concern.

As a result, USEPA adopted a set of four criteria to aid in determining which ingredients reported in the study should be characterized as VOCs. The term “reportable VOC” (RVOC) was coined by USEPA to indicate those ingredients. Although USEPA stated that this new term did not revise their definition of VOC, RVOC was the most practical approach in identifying those VOCs in products that could contribute to the formation of ozone.

Therefore, the MDEQ will use the four criteria developed by USEPA (listed below) to determine VOC emissions from non-surface coating process/process equipment and for determinations of compliance with any regulatory requirements or permit limits associated with the process/process equipment. MDEQ further intends to expeditiously undertake rulemaking to revise its current definition of VOC and incorporate the four criteria and submit the amended rule to USEPA for approval as a SIP revision. MDEQ is limiting this change to non-surface coating materials because the vast majority of compounds affected by the vapor pressure limit fall in this category of materials, and there is general agreement that surface coating materials are adequately addressed by the current definition.

## **POLICY**

Until the effective date of the revision to Subrule (f) of Rule 122 (R 336.1122), the definition of VOC in Michigan’s Administrative Rules for Air Pollution Control, the MDEQ shall establish the compounds subject to the VOC definition as follows:

### **A. GENERAL DETERMINATION OF VOC**

In addition to compounds already exempted in Rule 122 (f), the following compounds need not be included when determining the amount of VOC emitted from processes or process equipment subject to regulation in Part 2 (including the calculation of the amount of fee-subject air pollutants), Part 6 or Part 7 of the Michigan Air Rules:

- Acetone
- Cyclic, branched, or linear completely methylated siloxanes (see Table 1 for list of compounds)

However, these compounds are still subject to the Part 2 requirements for general air contaminants, including Rule 230 (R 336.1230).

### **B. NON-SURFACE COATING MATERIALS CONTAINING VOCS**

For the purpose of determining VOC emissions (which for this purpose is now identified as “reportable VOC”, or RVOC) associated with any emission source using non-surface coating materials that have ingredient compounds considered a VOC under MDEQ’s definition, and for

which a facility is identifying regulatory applicability and/or compliance with an emission standard, the ingredient compound is a RVOC as long as it meets one of the following criteria:

1. The ingredient compound exists as a solid at room temperature (20°C) but readily sublimates (becomes a vapor at room temperature). Examples include paradichlorobenzene, naphthalene and camphor.
2. The ingredient compound exists as a solid at room temperature (20°C) but becomes a vapor at the temperature at which the product is used. Examples include components of hot-melt glues, plug-in air fresheners, etc.
3. The ingredient compound has a vapor pressure greater than 0.1 mmHg at 20°C.
4. The vapor pressure for the ingredient compound is unknown and the compound's empirical formula contains 12 or less carbon atoms.

The term "non-surface coating materials" refers to materials that traditionally have not been considered surface coatings by the MDEQ. All materials affected by the surface coating limits in Rules 610, 620, 621, 624, and 632, and in permit conditions based on these rules, are excluded. Other common examples of non-surface coating materials include lubricating oils, cutting oils, and high molecular weight coolants.

#### C. REQUIREMENTS FOR PERMITS TO INSTALL:

Pursuant to the provisions of Rule 279, the requirement to obtain a permit to install under Rule 201(l) for a process or process equipment emitting acetone or methyl siloxanes (listed in Table 1 of this memorandum) does not apply to either of the following:

1. Any process or process equipment emitting not more than 1000 pounds per month of any of the following totaled together: noncarcinogenic VOCs, acetone, and methyl siloxanes, providing that all the following provisions also are met:
  - (a) A description of the process and equipment is maintained throughout the life of the process or process equipment.
  - (b) Records of material use and calculations identifying the quality, nature, and quantity of the VOC emissions and the acetone and methyl siloxanes shall be maintained in sufficient detail to demonstrate that the emissions are not more than 1000 pounds per month.
  - (c) The records shall be maintained on file for the most recent two-year period and shall be made available to the AQD upon request.
2. Any containers, reservoirs, or tanks of not more than 40,000 gallon capacity used exclusively for storage of VOCs, acetone, or methyl siloxanes, or any combinations of these materials, with a true vapor pressure of not more than 1.5 psia at the actual storage conditions.

In addition, as stated in the Preamble of this memorandum, the current VOC definition does refer to Rules 1004 and 1040 as containing the appropriate methods for measuring VOC for purposes of determining compliance with emission limits. It must be acknowledged that these methods may be incapable of distinguishing between non-VOC materials addressed in this memorandum and VOC as defined by Rule 122(f). In such case, formulation data or other methods and procedures acceptable to the MDEQ may be used for estimating the VOC content of materials. For example, if an exempt material such as acetone is present in a VOC gas stream and a procedure is used to isolate and subtract out the acetone from VOC, the procedure and methods must be acceptable to the MDEQ.

This memorandum is intended to provide guidance to AQD staff to foster consistent application of Part 55 of Act 451 of the Public Act of 1994, the Natural Resources and Environmental Protection Act and the administrative rules promulgated thereunder. This document is not intended to convey any rights to any parties nor create any duties of responsibilities under law. This document and matters addressed herein are subject to revision. Any future changes USEPA makes in the federal VOC definition will be evaluated by MDEQ. If similar changes in the Michigan VOC definition are warranted, MDEQ will revise this memorandum and will make the necessary rule changes.

Questions regarding this memorandum should be directed to Mr. Robert Irvine at 517-373-7042.

**TABLE 1**  
**VOLATILE METHYL SILOXANES**

<u>CAS NUMBER</u>	<u>CHEMICAL NAME</u>	<u>FORMULA</u>
<u>Linear VMS</u>		
107-45-0	Hexamethyldisiloxane (MM)	$C_6H_{18}OSi_2$
107-51-7	Octamethyltrisiloxane (MDM)	$C_8H_{24}O_2Si_3$
141-62-8	Decamethyltetrasiloxane (MD <sub>2</sub> M)	$C_{10}H_{30}O_3Si_4$
141-63-9	Dodecamethylpentasiloxane (MD <sub>3</sub> M)	$C_{12}H_{36}O_4Si_5$
107-63-9	Tetradecamethylhexasiloxane (MD <sub>4</sub> M)	$C_{14}H_{42}O_5Si_6$
63148-62-9	Dimethyl silicones and siloxanes (MD <sub>x</sub> M)	
<u>Cyclic VMS</u>		
541-05-9	Hexamethylcyclotrisiloxane (D <sub>3</sub> )	$C_6H_{18}O_3Si_3$
556-67-2	Octamethylcyclotetrasiloxane (D <sub>4</sub> )	$C_8H_{24}O_4Si_4$
541-02-6	Decamethylcyclopentasiloxane (D <sub>5</sub> )	$C_{10}H_{30}O_5Si_5$
540-97-6	Dodecamethylcyclohexasiloxane (D <sub>6</sub> )	$C_{12}H_{36}O_6Si_6$
69430-24-6	Cyclopolydimethylsiloxanes (D <sub>x</sub> )	
<u>Branched VMS</u>		
17928-28-8	1,1,1,3,5,5,5-Heptamethyl-3-[(trimethylsilyl)oxy]-trisiloxane (M <sub>3</sub> T)	$C_{10}H_{30}O_3Si_4$
3555-47-3	1,1,1,5,5,5-Hexamethyl-3,3,-bis[(trimethylsilyl)oxy]-trisiloxane (M <sub>4</sub> Q)	$C_{12}H_{36}O_4Si_5$
--- --	Pentamethyl[(trimethylsilyl)oxy]-cyclotrisiloxane (MD <sub>3</sub> )	$C_8H_{24}O_4Si_4$

BASED ON THE RESULTS OF REACTIVITY STUDIES